

## Claims

1        A method of dispensing a post-mix beverage comprising the steps of:  
 5        inserting into a dispenser a container of beverage concentrate connected to a  
       disposable pump unit, said disposable pump unit comprising a body having a surface  
       at which opens the mouth of a cavity formed in the body, an inlet port for the fluid  
       opening at the surface adjacent to the mouth of the cavity whereby, when the inlet  
       port is open, fluid can flow from the inlet port into the cavity *via* the mouth thereof, a  
 10       flexible membrane sealingly secured at its periphery to the surface and overlying the  
       cavity and the inlet port, an outlet port for the fluid , there being a fluid flow  
       passageway extending through the body connecting the cavity to the outlet port, and a  
       flexible membrane sealingly secured at its periphery and overlying the outlet port, the  
       portions of the flexible membrane, where it overlies the inlet and outlet ports  
 15       respectively, serving as closures for the ports; providing a flow of diluent; driving  
       the disposable pump unit by alternative application of vacuum and pressure by means  
       of a re-usable pump actuator so as to pump a regulated volume of beverage  
       concentrate, the concentrate only coming into contact with disposable parts;  
       regulating the pumped concentrate in such a manner that there is a substantially  
 20       constant output of concentrate during a dispensing step; regulating the flow of diluent  
       dependant on the quantity of concentrate being pumped in order to maintain a  
       substantially constant ratio of diluent to concentrate; bringing the pumped concentrate  
       flow together with the regulated diluent flow within a section of the disposable pump  
       unit; passing the combined flows together through a mixing means within the  
 25       disposable pump unit to provide a substantially homogeneous mixture of diluted  
       concentrate; and dispensing the mixture into a receptacle for consumption or storage.

2        The method according to Claim 1 wherein the areas into which the container  
       of beverage concentrate, and the disposable pump unit, are inserted are refrigerated .

3        The method according to Claim 1 or Claim 2 wherein the disposable pump unit has a plurality of cavities, the volume of each cavity is a fraction of the total volume of concentrate required for one beverage..

5        4        The method according to Claim 3 wherein the disposable pump unit has two cavities.

5        The method according to any of the preceding claims wherein upon insertion of the container of beverage concentrate and the disposable pump unit, the dispenser  
10       control system automatically “primes” the or each the pump cavity so that the or each cavity is full of concentrate ready to be dispensed.

6        The method according to Claim 3 or any claim appendant thereto wherein the priming time of a cavity is less than the dispensing time of a cavity and the dispense  
15       of concentrate from the cavities is overlapped such that there is no break in the flow of concentrate as it admixes with the diluent.

7        The method according to any of the preceding claims wherein the dispenser is pre-programmed with drink sizes which can be selected to dispense a beverage of a  
20       known size.

8        The method according to any one of Claims 1 to 6 wherein there is provided a continuous pour mode such that the dispenser will continuously dispense the beverage until signalled to stop.

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9        The method according to Claim 7 or Claim 8 wherein there is a time lag between the pour ending or being signalled to stop and the system automatically re-priming the pump, and if a pump cavity is half empty when the pour stops and the pour is resumed within said time lag the dispenser will continue to dispense from the  
30       same pump cavity without first re-priming thereby providing the system with a ‘top up function’.

10      The method according to Claim 9 wherein after said time lag has expired the dispenser primes all the pump cavities.

11      The method according to any of the preceding claims wherein the dispenser is  
5      provided with a signal comprising data indicative of the concentrate and/or pumping properties and the control of the concentrate flow rate is automatically effected via control circuitry, by these concentrate and/or pumping properties.

12      The method according to Claim 11 wherein the signal is automatically  
10      detected by the dispenser by reading data stored in identification means such as an RFID tag, EEPROM or barcode, attached to the concentrate reservoir or the disposable pump unit

13      The method according to Claim 11 wherein the signal indicative of the  
15      concentrate properties is inputted by an operator manually or through a handheld device.

14      The method according to Claim 3 or any claim appendant thereto wherein the dispenser has sensing means for sensing the concentrate flow continuity and where  
20      there is a flow discontinuity between dispense from the individual pump chambers, adapting control of the pump to eliminate the discontinuity.

15      The method according to Claim 14 wherein the sensing means monitors the build up of pressure and vacuum acting on the flexible membrane covering the pump  
25      cavity.

16      The method according to Claim 14 wherein the sensing means is a visual sensor is used to detect flow discontinuity of the concentrate being pumped.

30      17      The method according to Claim 12 wherein the data comprises a shelf life and the dispenser will not dispense a beverage if the concentrate contained within the reservoir is not within its shelf life.

18      The method according to any one of Claims 11 to 17 wherein the signal  
 identifies the volume of product in the reservoir, and the size of the doses it is  
 dispensing, and wherein the control circuitry counts down how many doses of  
 5      concentrate remain in the reservoir.

19      The method according to Claim 18 wherein the number of doses remaining is  
 displayed and/or a warning is made prior to the reservoir running out.

10      20      The method according to Claim 12 or any claim appendant thereto wherein  
 the dispenser has the capability of writing information back to the identification  
 means.

21      The method according to any one of claims 11 to 19 wherein the control  
 15      circuitry has a memory in which it stores data for each reservoir for a limited amount  
 of time after it is removed from the dispenser.

22      The method according to Claim 21 wherein if a part-used reservoir is replaced  
 in the dispenser after having been previously removed, the dispenser recognises it if  
 20      and when it is replaced and knows the volume of concentrate it is still contains.

23      The method according to any of the preceding claims wherein the temperature  
 of the concentrate is monitored and the control of the disposable pump unit is  
 modified dependant on the temperature.

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24      A beverage dispenser for dispensing a post-mix beverage from disposable  
 pump unit comprising a body having a surface at which opens the mouth of a cavity  
 formed in the body, an inlet port for the fluid opening at the surface adjacent to the  
 mouth of the cavity whereby, when the inlet port is open, fluid can flow from the inlet  
 30      port into the cavity *via* the mouth thereof, a flexible membrane sealingly secured at its  
 periphery to the surface and overlying the cavity and the inlet port, an outlet port for  
 the fluid , there being a fluid flow passageway extending through the body connecting

the cavity to the outlet port, and a flexible membrane sealingly secured at its periphery and overlying the outlet port, the portions of the flexible membrane which overlie the inlet and outlet ports respectively serving as closures for the ports, comprising: a diluent supply system to supply a regulated flow of diluent to a section of the disposable pump unit; a cabinet area for receiving at least one reservoir of concentrate; at least one pumping station for receiving, retaining and actuating a disposable pump unit, and a control system for controlling the metering of the concentrate and the flow rate of the diluent to dispense a required ratiometric mixture thereof.

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25 The beverage dispenser according to Claim 24 further comprising a lower section containing a diluent cooling means, an upper cabinet area for storing one or more containers of concentrate and a pumping section positioned between said lower and upper sections, said pumping section comprising one or more pumping stations, each station having a drive face to which the flexible side of a disposable pump unit is presented, said drive face being in fluid communication with sources of pressure and partial vacuum and having associated first and second valve actuators to open and close the inlet and outlet ports of the disposable pump unit, and clamping means for clamping the disposable pump unit in place.

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26 The beverage dispenser according to Claim 24 or 25 wherein the diluent supply comprises a diluent, e.g. water, inlet to the dispenser, a diluent cooling means, a flow meter to detect the flow of the diluent and a flow control valve to control the flow of the diluent.

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27 The beverage dispenser according to Claim 26 wherein the flow meter is a turbine flow meter.

28 The beverage dispenser according to Claims 26 or Claim 27 wherein the flow control valve is a variable orifice valve.

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29      The beverage dispenser according to any one of claims 26 to 28 wherein the flow control valve also acts to shut off the flow when no diluent is required.

30      The beverage dispenser according to any one of claims 26 to 28 wherein an  
5 additional on/off diluent valve is provided.

31      The beverage dispenser according to Claim 25 or any claim appendant thereto wherein the diluent is supplied to the clamping means and is interfaced with the disposable pump unit when the clamping means is secured in place.  
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32      The beverage dispenser according to Claim 31 wherein immediately upstream of the disposable pump unit the diluent supply line is provided with a closure.

33      The beverage dispenser according to Claim 25 or any claim appendant thereto  
15 wherein the diluent cooling means comprises a refrigerated water bath containing a refrigerant coil around its periphery upon which builds a bank of ice, and a diluent coil situated in the liquid phase of the water bath and through which the diluent passes.

20 34      The beverage dispenser according to claims 24 or any claim appendant thereto wherein the cabinet area for receiving the reservoir of concentrate is refrigerated.

35      The beverage dispenser according to any one of claims 24 to 32 wherein at least one temperature probe is provided within the cabinet area to monitor the  
25 temperature therein.

36      The beverage dispenser according to any one of claims 24 to 34 wherein there is provided a rigid retaining enclosure into which a flexible reservoir, e.g. bag, of concentrate can be placed prior to installation into the cabinet area.  
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37      The beverage dispenser according to Claim 36 wherein the bottom interior surface of the retaining enclosure is angled such that when in situ the concentrate



within the reservoir will tend to flow, under the influence of gravity, to the lower front region of the reservoir, to which region the disposable pump unit is attached.

38     The beverage dispenser according to Claims 37 wherein the angle is in the  
5     range 12 o 25 degrees.

39     The beverage dispenser according Claim 37 or Claim 38 wherein the lower  
surface of the cabinet area is at an angle which corresponds to the angle on the bottom  
of the rigid retaining enclosure.  
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40     The beverage dispenser according to any one of claims 35 to 39 wherein the  
rigid enclosure has a hole therein which aligns with the temperature probe which  
protrudes from the cabinet area such that in use it contacts directly with the flexible  
reservoir within the rigid enclosure in an area in proximity to the disposable pump  
15     unit giving a temperature reading substantially indicative of the temperature of the  
fluid being pumped.

41     The beverage dispenser according to any one of claims 24 to 40 wherein the  
drive face has therein a number of concave recesses corresponding and aligning with  
20     the pump cavities of the disposable pump, each recess having therein a port which  
communicates via a line with the sources of pressure and partial vacuum.

42     The beverage dispenser according to any one of claims 24 to 41 wherein the  
source of pressure comprises a pressure pump, a pressure release valve and a pressure  
25     regulator to control the pressure being provided to the disposable pump unit.

43     The beverage dispenser according to Claim 42 wherein the pressure regulator  
is electronically variable and the pressure is automatically regulated dependent on the  
viscosity of the concentrate which is being pumped.  
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- 44      The beverage dispenser according to Claims 42 or 43 further comprising a 2/2 valve associated with each recess on the drive face for switching the regulated pressure on and off.
- 5      45      The beverage dispenser according to Claim 42 wherein high-speed pulsed digital valve used to combine the features of the regulating and switching the positive pressure.
- 10      46      The beverage dispenser according to any one of claims 24 to 45 wherein the supply of partial vacuum is provided by means of a vacuum pump which leads to a one or more 2/2 valves, each of which associated with a recess on the drive face.
- 15      47      The beverage dispenser according to any one of claims 41 to 46 wherein a sensor is provided in the partial vacuum line to detect if there is any concentrate in the line.
- 20      48      The beverage dispenser according to Claim 47 wherein the sensor is a visual sensor.
- 20      49      The beverage dispenser according to any one of claims 41 to 48 wherein a pressure and partial vacuum reservoir are provided in the pressure and vacuum lines respectively.
- 25      50      The beverage dispenser according to Claim 49 wherein a drain is provided in the bottom of each of these reservoirs which is selectively openable.
- 30      51      The beverage dispenser according to any one of claims 25 to 50 wherein the first valve actuator protrudes through the drive face into the recess therein and is operable to selectively move the flexible membrane onto the lip of the inlet port within the cavity of the disposable pump unit to close the inlet port.



52      The beverage dispenser according to Claim 51 wherein the first valve actuator is driven by a solenoid.

53      The beverage dispenser according to any one of claims 25 to 52 wherein the  
5      second valve actuator associated with, and adjacent to, each recess is actuated to selectively move the flexible membrane of the disposable pump unit onto a lip surrounding an outlet port associated with, but distinct from, the pump cavity to close the pump outlet port.

10      54      The beverage dispenser according to Claim 53 wherein the second valve actuator is driven in a proportional manner such that the degree of opening or closing of the outlet port can be controlled to vary the outlet flow.

15      55      The beverage dispenser according to Claim 54 wherein the second valve actuator is driven by means of a stepper motor.

20      56      The beverage dispenser according to claim 55 wherein the stepper motor control is overdriven in its closed position and then re-zeroed every time the outlet port is closed.

57      The beverage dispenser according to any one of claims 25 to 56 wherein a rolling diaphragm seal is provided between the valve actuators and the drive face.

25      58      The beverage dispenser according to any one of claims 25 to 57 wherein the first and second valve actuators are provided with soft tips so that no damage is made to the flexible membrane as it is pressed against the lip of a port.

30      59      The beverage dispenser according to any one of claims 25 to 58 wherein surrounding the recesses in the drive face is a gasket which forms a seal with the disposable pump unit such that the application of positive and negative pressure only effects the flexible membrane where it covers the pump chamber.

60 The beverage dispenser according to any one of claims 24 to 59 wherein the pumping station is adapted to receive a disposable pump unit having two pump cavities.

5 61 The beverage dispenser according any one of claims 24 to 60 wherein the beverage dispenser comprises a plurality of pumping stations.